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AUTHOR Goldsmith, Linda H.
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ABSTRACT

This paper discusses recent efforts in the state of Michigan to maintain diverse, high quality course offerings in the face of declining enrollments. Following a brainstorming session to come up with ways for providing opportunities in such endangered subject areas as advanced languages, mathematics, and science, a Kent (Michigan) Intermediate School District special committee attempted unsuccessfully in 1981-82 to institute a county-wide pilot program course in calculus-physics that required students to leave their home schools. Subsequently, the committee developed a TV course, "Calculus via Telecommunications," which was made available for the 1983-84 school year to all 25 area high schools. Another project, designed by the Kalamazoo (Michigan) Association for the Talented and Gifted to provide an accelerated math and verbal program for gifted sixth, seventh, and eighth grade students, addresses the problem of declining enrollment by gathering selected students together once a week for courses housed on the Kalamazoo College campus. Appendixes include the Kent Intermediate School District's announcement/outline of its "Calculus via Telecommunications" course and percentile tables of nationwide mathematics test results. (JBM)

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USING TECHNOLOGY AND COOPERATIVE PLANNING TO OFFER
ADVANCED COURSES IN SCHOOLS FACING DECLINING ENROLLMENTS

Linda H. Goldsmith

Kent Intermediate School District
2650 East Beltline, S.E.
Grand Rapids, MI 49506

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American Educational Research Association
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Using Technology and Cooperative Planning to Offer Advanced Courses in Schools Facing Declining Enrollments

With the current economic woes and declining populations besetting school districts, educators are finding it difficult to maintain a complete curriculum meeting the diverse needs of all students. As there are over five hundred separate and independent school districts in Michigan, the present curriculum is already spread rather thinly across the districts. Therefore, after the so-called frills have been pared from the curriculum, the advanced courses appear to be the next to be eliminated. Thus we see third and fourth year French, Spanish and German disappearing. Latin, that classical mainstay, has already vanished from many high school schedules. There are high schools in Michigan whose entire foreign language offering is Spanish I.

Other courses that have been cut because of low enrollments are the sciences, advanced mathematics, some vocational courses and accelerated programs at the elementary level. School districts across the country are exploring ways of dealing with this problem. Many acknowledge the problem but few offer solutions.

A major purpose in presenting this paper is to bring this issue to light and generate serious discussion of the problem of maintaining the quality and diversity of course offerings in the face of declining enrollments. We at Kent Intermediate have been investigating this problem with our local districts for two years. We are a regional service agency serving twenty local school districts ranging in size from 900 students K-12 to the Grand Rapids Public Schools with over 34,000 students. We sought model solutions elsewhere but found none. We suspect there are some "out there" but that these solutions are tentative

and that their developers do not yet realize the interest that other districts might have in these pilot projects.

This presentation will chronicle three alternative solutions to the problem. All three involve pooling students from many districts: one proposes one-way cable TV and video tape; one uses innovative grouping; one uses interactive two-way TV. It is hoped that in the coming year more solutions will emerge.

In the Fall of 1980, at a meeting of the Kent County Superintendents' Association, several superintendents raised the problem of having to drop courses or having to run courses at great expense because of low enrollments. A committee was authorized by that group to study and seek solutions to this problem. The committee was organized by the Associate Superintendent for Instruction of Kent Intermediate School District (one of Michigan's fifty-eight regional service agencies) and included other ISD representatives, superintendents, curriculum directors and high school principals.

A survey was sent to all high school principals asking for a list of courses with enrollments of fewer than fifteen students. Results indicated that courses being dropped or in danger of being dropped were advanced languages, math and science. There were some specialized art courses, vocational courses and remedial courses in this category.

We then brainstormed all the possible ways we could come up with to provide opportunities for students to take these courses. The list ran from correspondence courses to consolidation of school districts. Other ideas included busing students daily to a central location (using the Skills Centers and their busing system already in place), independent study, expanded summer schools, Saturday or evening classes, combining courses (e.g., third and fourth year languages) programmed instruction, computer assisted instruction, traveling teachers and mobile classrooms (e.g., mathmobile, Frenchmobile, physicsmobile).

We tried to find other districts in Michigan or anywhere else that were facing the same problem and had explored some solutions. We followed up on all leads, but we found very few cooperative efforts. In fact, it seems to be a major accomplishment when two high schools within a single district can arrange some joint classes. The Grand Rapids Public Schools appear to be a leader in this area with their Educational Park concept. Educational Park was initiated in 1968 to deal with the problem of low enrollments in certain specialized classes. Students are bused from the four city high schools to a central facility where they take courses ranging from pottery and theatre arts to calculus and fourth year languages.

Following the brainstorming, the Cooperative Scheduling Committee explored the advantages and disadvantages of cooperative programming. Among the advantages are the following:

Students have access to courses they would not ordinarily be able to take.

Able students who are often isolated have an opportunity for peer interaction.

Communication across district lines is increased.

Districts who were offering courses to small numbers of students no longer have to incur this expense.

In a program involving bringing together students from several districts are the following disadvantages:

School districts sending students to other districts for courses lose their state aid.

Transportation is a problem.

Where transportation exists, such as for skills centers, students have to be prepared for a two hour block of courses.

Some teachers' organizations are concerned about losing existing positions.

After examining the pros and cons of all ideas suggested and after deciding that the advantages in attempting a solution to the problem outweighed the disadvantages, the committee decided to offer a pilot program for the 1981-82 school year. This pilot was to use the Grand Rapids Educational Park program and the Kent Intermediate Skills Centers' transportation network. Students would be invited through their local high schools to enroll in a calculus and physics course offered through Educational Park. Grand Rapids Public Schools would provide materials and staff and districts would be billed back on a per pupil cost basis.

Along with this county-wide pilot program, the following suggestions were also made:

- * It is further recommended that smaller consortiums of high schools at the regional levels make serious attempts to offer low incidence level classes on a cooperative basis for the Fall of 1981.
- * It is recommended that local high schools seriously consider combining two or more levels of a given class (i.e., third and fourth year languages, art and advanced art, etc.)
- * It is recommended that a group, including Kent Intermediate personnel, LEA central office administrators and high school principals be formed during the summer of 1981 to explore further plans for 1982-83, as well as long-range plans for cooperative scheduling activities.

All three of these recommendations were followed to some degree. The small consortiums were developed on a very limited, informal basis; classes were already being combined; and the second committee was formed, with some of the original members.

The pilot itself, however, was not implemented. No students from outside the Grand Rapids Public Schools enrolled in the calculus-physics course. When we investigated the reasons for the lack of enthusiasm for this program, we found two major stumbling blocks. The first is that word of the pilot was not getting out to all students; the second is that many students who were told about the program were reluctant to leave their home schools.

Thus, one of the charges to the new committee was to come up with a plan for students to take advanced courses without leaving their home schools. The committee itself was expanded to include technology and media specialists to explore ways to offer courses via technology.

I took on the task of investigating how students from diverse areas could take a class without having to travel to a central location. In attempting to search the literature on this subject, I came upon the term "distance education," a term which, at first glance, appeared to promise solutions to our predicament. Definitions of distance education abound. However, Desmond Keegan suggests the following characteristics:

- * the separation of teacher and learner which distinguishes it from face-to-face lecturing
- * the influence of an educational organization which distinguishes it from private study
- * the use of technical media, usually print, to unite teacher and learner and carry the educational content
- * the provision of two-way communication so that the student may benefit from or even initiate dialogue
- * the possibility of occasional meetings for both didactic and socialization purposes
- * the participation in an industrialized form of education which, if accepted, contains the genus of radical separation of distance education from other forms.

(Keegan 1980, p. 33)

What Keegan does not mention is that most discussion of distance education appears to be directed toward post-secondary education. For instance, in discussing terminology in the United States, Keegan suggests: "... 'home study' should be regarded as the further education section of distance education and 'independent study' as the higher education section" (p.33). As recently as last year, Coldeway and Spencer confined distance education to "a modern day solution to a growing demand for post-secondary education" (1982, p.51).

The distance education literature suggests four media on which learning materials are based: print, audio, video and computer-based programs. The print-based mode until now has been the most popular--the traditional correspondence courses. However, Worthington points out: "Traditionally, based upon print technology, distance education systems have, since the mid 1960's become increasingly aware of the potential educational value of audio-visual and telecommunications technologies" (1980, p.3). Keegan concurs: "Higher education in the United States of America is an area where an attempt to transfer emphasis to videotape-based or computer-based programs might be worth considering because of the population's interest in technology and dislike of correspondence study" (p.22).

The trick is not so much in selecting the appropriate medium but "in the skillful combination...The different media or learning experiences should be interdependent and interactive so that one dimension enhances every other dimension" (White, 1980, p.23).

Cognizant of the need to keep students in their home schools as much as possible, the increasing availability of an interest in technology and the importance of that "skillful combination," our Cooperative Scheduling Committee began to explore the possibility of offering a course using the TV cable system already in place in the Grand Rapids area.

Because of the time and resources involved in developing and producing a TV course, a search was made for an appropriate course already on video tape. We perused the catalogues but found mainly supplemental-type courses, a few beginning language courses and some college level social science and humanities courses. We finally did locate a calculus course through the Maryland Center for Public Broadcasting. However, by this time we had missed our deadline to include the course in the 1982-83 offerings for each of the high schools. There was an attempt made to recruit students over the summer. A meeting was held

with superintendents and high school principals to provide information about the calculus course. However, the task of identifying students over the summer by checking records and calling teachers, then of convincing students to change their fall schedules would have required quite a bit of time and effort, not to mention the difficulty of locating the appropriate teachers and students.

Therefore, the "Calculus via Telecommunications" course is being made available for the 1983-84 school year to all twenty-five area high schools. The course will combine some of the characteristics of distance education with those of traditional education. The medium selected to convey the course will be the video medium, cable TV. Video tapes will be made available for districts not having access to the cable or for students missing the broadcasts, and wanting a review, or just wishing to have the lecture presentation repeated. The print medium, that mainstay of all instructional programs, will be a traditional calculus text and workbook.

For face-to-face contact, the students will meet together as a class once a week to ask questions, discuss problems, review previous lessons and preview new lessons. See Appendix A for the announcement sent to high schools describing the program.

Our plan is to evaluate this course comparing it with a conventional high school calculus course and with a freshmen college calculus course all using the same text.

Using Cooperative Scheduling to Provide an Accelerated Math and Verbal Program for Gifted Sixth, Seventh and Eighth Grade Students

This project, using innovative grouping, was initiated to identify and develop the untapped potential of the mathematically and verbally able youth in the Kalamazoo area. Its purpose is to serve students whose needs are not being met because of austerity budgets and/or small numbers of such students in any one building or district.

Part of the uniqueness of this program is that it is a community venture. The Kalamazoo Association for the Talented and Gifted, primarily a parent group, administers and coordinates the program; local colleges house the program and serve as its fiscal agent; the public schools assist with instruction and accept the course for credit. The Kalamazoo program is modeled after the Johns Hopkins Study of Mathematically Precocious Youth initiated in 1971 by Julian Stanley.

Once selected into the program, students meet weekly during the academic year for two and one-half hour, fast-paced math and writing skills courses housed on the Kalamazoo College campus. By prior arrangement, these students are released early by their schools that one afternoon a week. Then parents provide transportation to the instruction site.

This program is a break from the traditional, almost sacrosanct one hour a day, five days a week class schedule. Since students are coming together from a wide geographical area, the one day a week meeting simplifies the transportation problem. This format also causes the least disruption in the students' regular class schedules.

Since students selected for this program are highly capable and motivated, they are able to work independently in between classes, contacting each other or the instructors if necessary for answers to questions that arise between meetings or when completing assignments.

During the pilot 1981-82 year, the math component was implemented. Area math teachers were asked to identify their brightest students. Of 121 students tested, twenty-five qualified for the fast-paced math class. Twenty-two students representing seven school districts participated in the class. The intent was to enable these students to complete the first two years of the precalculus high school math sequence in one year. Seventeen students met that goal. In fact twelve chose to return for a second year to complete the precalculus sequence.

The students flourished under the nontraditional schedule, for all those who stayed with the program completed at least Algebra II. See Appendix B for test scores. Five students dropped out of the program citing the difficulty of keeping up with the fast pace as the reason, rather than the unorthodox schedule.

The third alternative solution using two-way interactive TV, discussed in a separate paper, "Two-way Telecommunications: A Viable Technology for Rural Instruction?"

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APPENDIX A

KENT INTERMEDIATE SCHOOL DISTRICT CALCULUS VIA TELECOMMUNICATIONS 1983-84 SCHOOL YEAR

Course - Calculus

Length

2 semesters

Methods

Two 30-minute televised instructional programs per week for 30 weeks.*

One 1 hour discussion session per week with instructor and other students.**

Independent study (using text and student workbook)

*Each television program would be aired several times during its scheduled week over Channel E (in Wyoming and Grand Rapids via GE Cablevision). Other schools would receive the program via video tapes or over their own community cable systems.

**A regionally suitable location and time will be established where several students can meet with an instructor for these sessions. The number of sites will depend upon the number of students enrolled.

Materials

Text

Thomas, George B., Elements of Calculus and Analytic Geometry, 1976, Addison-Wesley.

Student Manual

Calculus, Pt. 1 and Pt. 2, 1975. Maryland Center for Public Broadcasting.

Videotapes

Copies of six programs (3 weeks) at a time will be available for each school participating. These are to meet the needs for review, additional viewing, and absence due to illness. Each week a pair of tapes will be supplied and the oldest set returned for re-recording.

Content

See attached table of contents per student manual, Pt. 1 and listing of the 60 television programs.

Student Pre-requisites

Algebra, Plane Geometry, second year Algebra (including Trigonometry). A precalculus course is recommended, but not absolutely essential.

APPENDIX A

Costs

Option I:

\$100.00 per student, payable to Kent Intermediate School District

Option II:

A high school may wish to provide its own qualified instructor for independent study. Fee to Kent Intermediate School District would be \$50.00 per student.

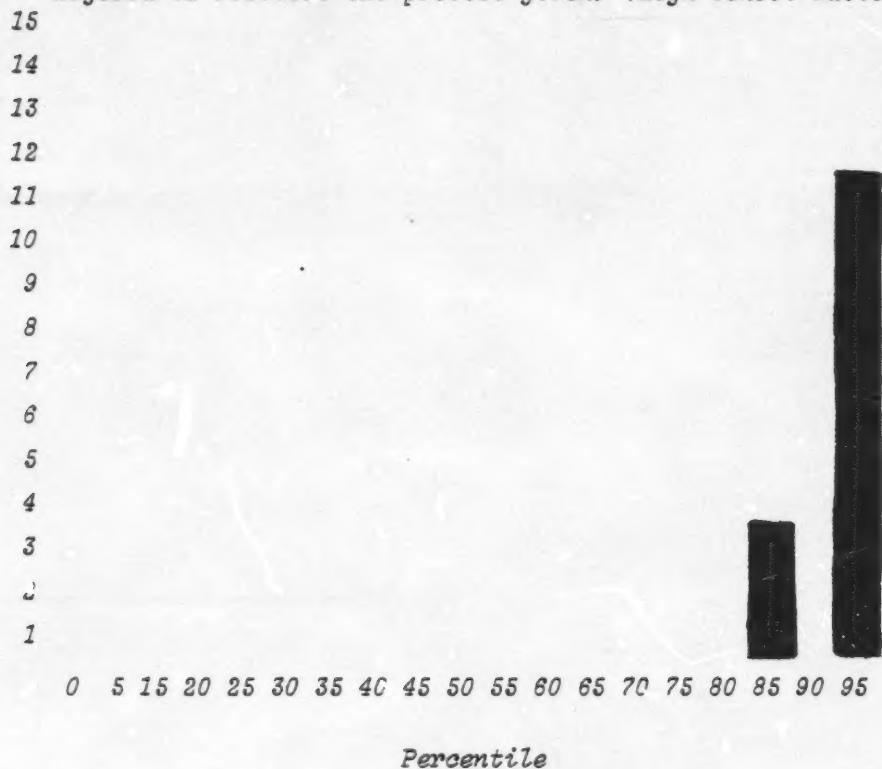
Kent Intermediate School District will be responsible for providing all necessary materials and arranging for qualified instructors. A minimum enrollment of fifteen students would be required for the course to be offered.

Schedule

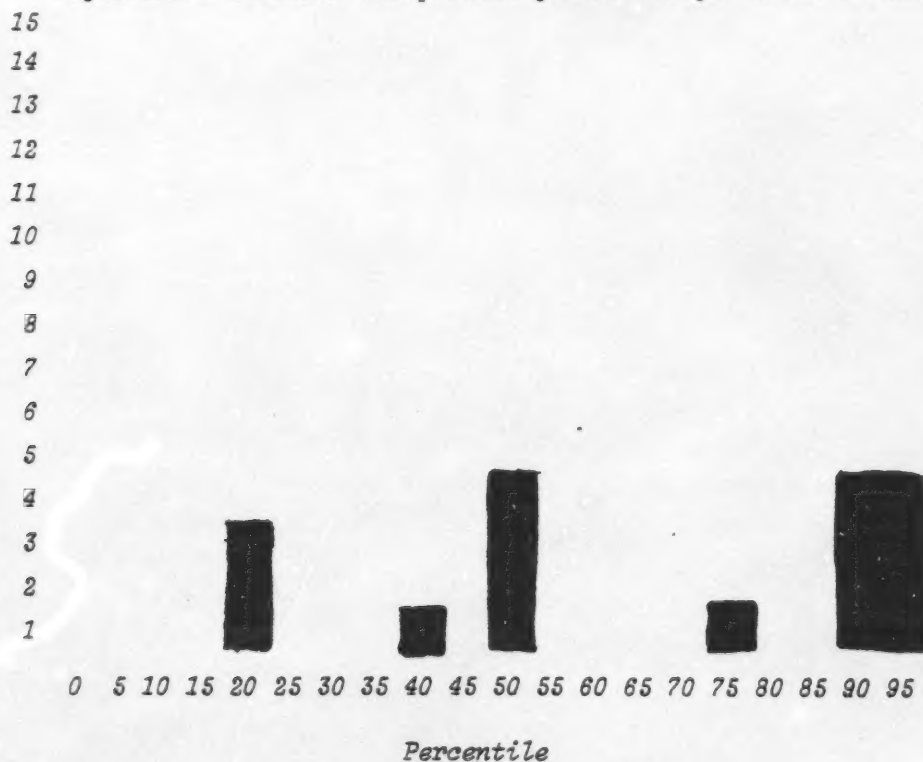
Details as to dates and times for showing the programs via cable TV and the schedule for discussion sessions will be announced by August 12, 1983. It is necessary to know who is interested in taking the course before all of these details can be arranged.

COOPERATIVE MATHEMATICS TEST

Algebra II Posttest (No pretest given) (High School National Urban Norms)

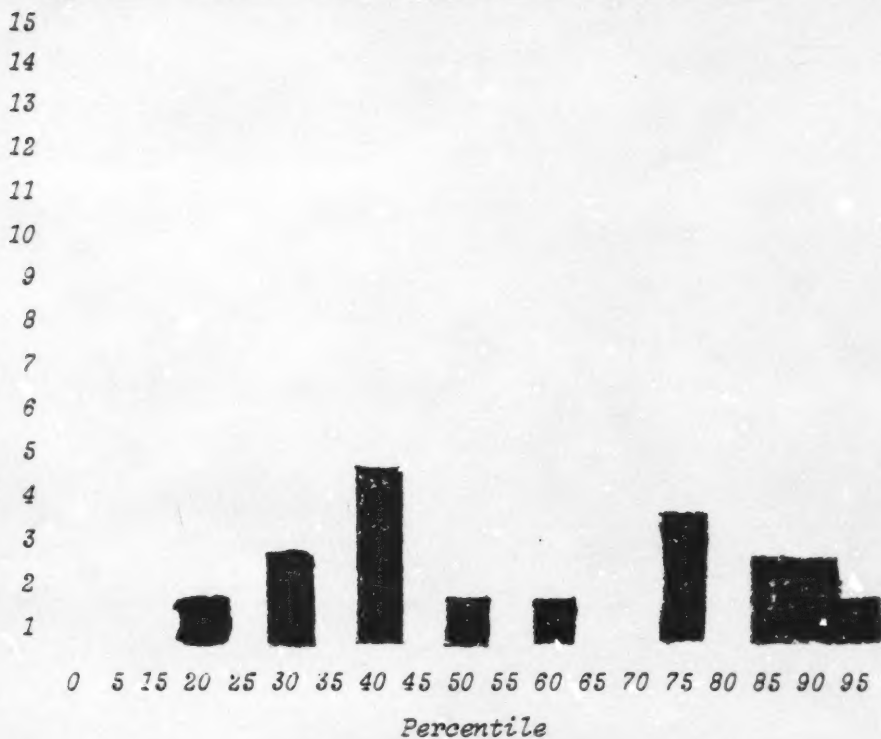


Algebra III Posttest (No pretest given) (High School National Urban Norms)

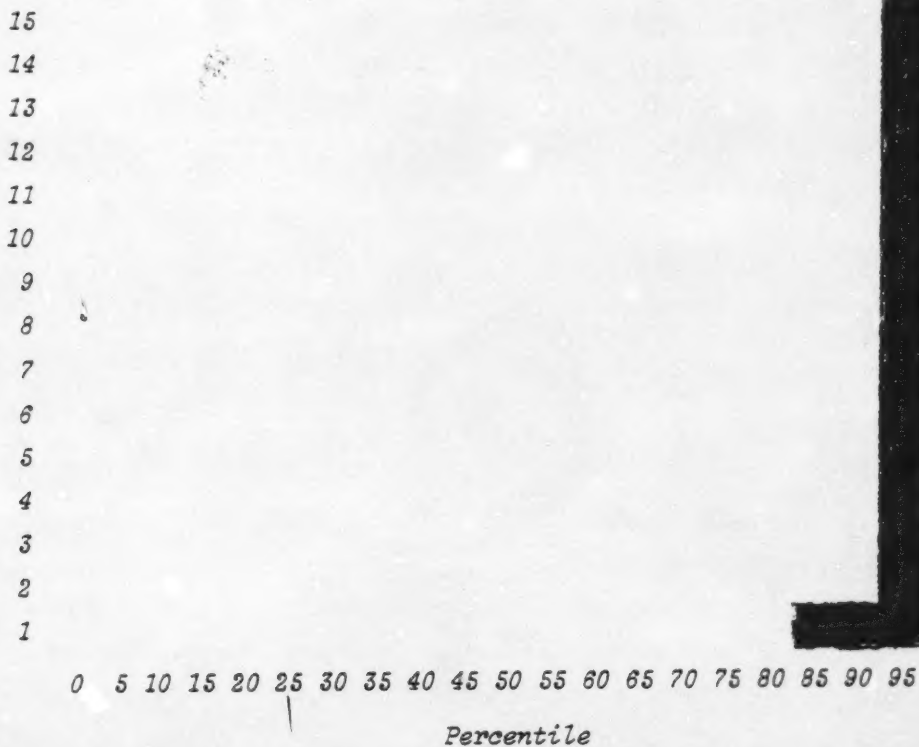


COOPERATIVE MATHEMATICS TEST

Algebra I Pretest (Ninth Grade National Urban Norms)



Algebra I Posttest (Ninth Grade National Urban Norms)



COOPERATIVE MATHEMATICS TEST

	Algebra I Pretest (9th Grade Norms)	Algebra I Posttest (9th Grade Norms)	Algebra II Posttest (High School Norms)	Algebra III Posttest (High School Norms)
95	1	15	11	4
90	2	1	1	4
85	2	1	3	
80				
75	3			1
71				
65				
60	1		1	
55				
50	1			4
45				
40	4		1	1
35				
30	2			
25				
20	1			3
15				
10				
5				
0				

Number of students